

SAN FRANCISCO FORECAST DISTRICT.†
[California and Nevada.]

The month was unusually dry. A drought that began early in March continued until the beginning of the third decade of April. With the exception of some showers at the close of March it was one of the longest spring dry spells experienced for many years in California. No frost nor storm warnings were issued.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.†
[Oregon, Washington, and Idaho.]

The month was warmer than usual and precipitation was deficient. Two storms of note crossed the district, one on the 17th and the other on the 24th. Warnings for these storms were timely and no casualties of consequence are known to have occurred. Frosts were frequent and all important frosts were forecast sufficiently in advance for the warnings to be of benefit.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The rivers of the northern portion of the country showed, as a rule, very little departure from their usual gage readings. The breaking of a dam on the upper Missouri River, 15 miles north of Helena, Mont., caused considerable local damage and for a time threatened serious loss, but the removal of obstructions and a dam by dynamite relieved the situation and the water subsided without serious damage, excepting the loss of two lives, one of which occurred when the dam was blown up.

During the last of March and the first of April excessive rains fell over the mountains of West Virginia and Kentucky, causing rapid and destructive rises of all the southern tributaries of the Ohio River below Parkersburg, W. Va. These, flowing into the already well-filled Ohio, caused a rapid rise of that stream, and flood stages were past at all points from Point Pleasant, W. Va., to Cairo, Ill.; the flood stage being exceeded at Cincinnati by 5.9 feet and at Cairo by 0.3 of a foot. This was the fourth and also the greatest flood this year. It also is of interest to note that, when the Ohio fell below the

former flood stage of 40 feet at Cairo, Ill., on the 22d, with the exception of four days, the water had been above this mark since February 18.

Very little damage has been reported, except the loss of growing crops, owing to the timely and accurate warnings that were issued.

Heavy rains also fell over the lower portion of the Mississippi Valley, and as a result all the tributaries of the lower Mississippi River were high and several times exceeded the flood mark and overflowed the bottoms, causing some loss to live stock and to early planting, especially along the Red, Arkansas, and White rivers. These floods, combined with the heavy rains and the passage of the flood waters of the Ohio River, caused the Mississippi River to exceed flood stages thruout its length from the Ohio River to the mouth, in fact, the mean stages of the river below Memphis, Tenn., to New Orleans, La., for the month, were above the flood mark, and at several places the lowest reading for the month was above the flood line. Ample and timely warnings were issued for this high water by all the districts and very little damage has been reported. The breaking of one or two levees was reported, and by quick work the crevass was closed before much damage had occurred.

The rivers of the South Atlantic States did not exceed flood-stage mark during the month, altho some high water was reported.

The Trinity, Brazos, and Colorado rivers of Texas were all in flood, caused by the heavy rains during the last of the month, and considerable damage was done, especially along their upper portions, where the water rose higher than it has for several years.

The rivers of the Pacific coast were, as a rule, quiet, and were highest during the last days of the month.

The highest and lowest water, mean stage, and monthly range at 214 river stations are given in Table IV. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*Hermann E. Hobbs.*

* Morning forecasts made at district center; night forecasts made at Washington, D. C.

† Morning and night forecasts made at district center.

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

CHINOOK WINDS IN EASTERN COLORADO DURING DECEMBER, 1907.

By L. H. DAINGERFIELD, Local Forecaster. Dated Pueblo, Colo., April 22, 1908.

The following text, with the accompanying daily maps and thermograms, see Charts IX and X, illustrates the chinook conditions prevailing over eastern Colorado during the closing week of December, 1907. Mountain time is used in both the text and the diagrams.

December 22.—Unusually well-developed chinook conditions prevailed over eastern Colorado during the closing week of December, 1907. During this week the pressure was relatively high almost continuously from the region where the Continental Divide crosses Colorado and New Mexico to California. A series of storms moved with great regularity from British Columbia southeastward over Montana and the Dakotas, eastward across the Lake region, and down the St. Lawrence Valley to the coast. Such was the condition on the morning of December 22, 1907, when a great indraft of air was being drawn eastward from over the mountains as is evidenced by the brisk westerly wind which prevailed at Pueblo at intervals between 1 p. m. of the 22d and 5 a. m. of the 23d, the maximum being 37 miles per hour from the west at 10:49 p. m. A glance at the accompanying thermograph trace will show a harmonious temperature response to the strong draft from over the mountains.

December 23.—The forenoon of December 23 shows a continuation of the foehn conditions of the preceding day, being augmented, as is frequently the case, by a small secondary depression over eastern Colorado. The temperature on this date exhibits remarkable variation between 1 and 9 a. m., during which time Pueblo was undoubtedly under the influence of the local depression. In Colorado the moderate precipitation on the western slope of the mountains possibly influenced the eastern slope temperature to some extent.

December 24.—A well-developed storm covered the Dakotas and eastern Montana on the morning of December 24, and the pressure remained moderately high over the Southwest and also over the California coast. Brisk to high westerly to northwesterly winds resulted at Pueblo between 10 a. m. and 6 p. m., reaching the velocity of a gale at 12:45 p. m., when a movement of 45 miles per hour from the northwest was recorded. This strong indraft from over the range of mountains was attended locally by a maximum temperature of 63° which coincided in time with that of the occurrence of the maximum wind velocity.

December 25.—A high-pressure area developed over the eastern slope by the morning of December 25 which destroyed the persistent chinook condition, but another depression had appeared over British Columbia.

December 26.—The British Columbia disturbance was central

north of Montana by the morning of the 26th, showing a steep pressure gradient from New Mexico northward to the storm center. A northwesterly gale resulted at Pueblo, from 9 a. m. to 3 p. m., reaching a maximum movement of 52 miles per hour from the northwest at 11:42 a. m., breaking all but two local maximum wind records for the month. The resulting high temperature shows an unmistakable chinook condition.

December 27.—The storm center had advanced to Lake Superior by the morning of the 27th, but the pronounced tendency to form secondary depressions over the eastern slope is again verified. This slight depression prolonged the local chinook condition during the morning and forenoon of the 27th, and was attended by a brisk westerly wind during the early hours of the day, the maximum being 34 miles per hour from the west at 1:14 a. m. The eastern slope chinook was, no doubt, augmented by the general precipitation prevailing on the western slope in Colorado on the date mentioned above.

December 28.—An area of high pressure had moved southward from the Canadian interior over the eastern slope and the central valleys by the morning of the 28th, thus again disturbing the persistent foehn conditions, but another storm had appeared over British Columbia, and a disturbance was central over southern Utah.

December 29.—The storms had crossed the Divide by the morning of the 29th, being replaced by a high pressure area, thus reestablishing temporary chinook conditions. A brisk westerly wind prevailed between 1 and 2 a. m. reaching a maximum of 26 miles per hour; the local temperature responded by rising from 22° at midnight to 40° at 2 a. m. The foehn conditions gradually gave way during the afternoon, thus ending one of the most persistent periods of warm westerly winds in the history of this station.

CLIMATE OF KANSAS.¹

By T. B. JENNINGS, Section Director. Dated Topeka, Kans., December 7, 1907.

Kansas, the central State of the Union, is situated between 37° and 40° north latitude, and 94° 38' and 102° 2' west longitude.

The State ranges in elevation from 700 feet above sea level in the southeastern part of Montgomery County to 4,120 feet in the northwestern part of Greeley and southwestern part of Wallace counties. For climatic purposes the State is technically divided into western, middle, and eastern divisions. The first named comprises the four western tiers of counties in the northern half and the five western tiers of counties in the southern half of the State. Marshall, Riley, Geary, Morris, Chase, Greenwood, Elk, and Chautauqua counties constitute the western counties of the eastern division.

The average and extreme values of each element for all the stations in each of the three divisions of the State are given in the accompanying Tables 1 and 2.

For comparing temperature conditions it is essential that we have a standard of value, and this standard is assumed to be the average temperature, be it daily, monthly, or annual, and this average when determined from a long period of years is denominated the normal. But in studying the climate of a place the average temperature will be misleading if sole reliance is placed upon it. The extremes of temperatures are also controlling factors; for instance, on the average for the whole State the temperature for January is 29.2°, but during the past twenty years our temperature in January has ranged between 34° below zero in the eastern division and 80° above zero in the western, a range of 114° for the whole State during twenty years.

The mean annual temperature varies between 51° in the extreme northwestern counties and 57° in the extreme southeastern.

The mean winter temperature ranges from 28° in the northern counties to 33° and 34° in the southern. The mean spring temperature varies between 50° in the northwestern counties and 57° in the southeastern. The mean summer temperature ranges from 74° in the northwestern counties to 79° in the southeastern. The mean autumn temperature varies between 52° in the northwestern counties and 58° in the southeastern.

MAXIMUM TEMPERATURE.

Over a large part of the State the highest temperatures recorded exceed 110°, tho it has not reached that point at Wichita, Hutchinson, or Dodge City. Nor has it reached that height in the eastern counties north of Cherokee, nor in the northern counties.

The recorded maximum temperature reached 115° in 1860, 1894, and 1896.

MINIMUM TEMPERATURE.

In five of the past twenty years the minimum temperature for December has not gone below zero. Since records have been kept the minimum temperature has fallen below zero every January, and has reached 30° below zero, or lower, in January, 1887, 1888, 1892, and 1905.

During the past twenty years the minimum temperature in February has been zero, or lower, except in February, 1906, when the lowest temperature recorded in the State was 1° above zero. The minimum temperature in February reached 30° below zero, or lower, in 1899 and 1905.

There had been some low temperatures previously. In 1780 the Kaw River remained frozen from one full moon to the next. During the winter of 1796-97 "all streams remained frozen for 30 suns." These traditions are borne out by conditions that prevailed in our neighborhood. In the cold of 1780 Bayou St. John (New Orleans) was frozen over. In 1796-97 the Ohio and Mississippi rivers were frozen over below Cairo, Ill.; the minimum temperature at Cincinnati being 14° below zero in December and 18° below in January. January and February, 1831, were "bitter cold," and in December, 1831, "all streams were frozen," and at the same time the Mississippi was frozen over for a distance of 130 miles below the mouth of the Ohio River. February, 1838, was always referred to by the Indians as a "cold moon." The mean temperature at Fort Gibson, Ind. T., was 15° below the normal for that month. The winter of 1855-56 was one of the severest ever known in this latitude. The mean temperature for January, 1856, at Fort Leavenworth, was 10.1° and at Fort Riley it was 11.0°. January, 1857, was also cold, the mean temperature at Fort Leavenworth being 12.1° and at Fort Riley 9.4°. January, 1862, 1868, 1873, 1875, and 1886 were exceptionally cold, as shown by records at Forts Leavenworth and Riley.

FROST.

The average date of the last killing frost in spring ranges from April 6 in the extreme southeast corner of the State to May 5 in the northwestern counties. The average date of the first killing frost in autumn ranges from September 30 in the northwestern counties to October 25 in the extreme southeastern. The average number of growing days (interval between last and first killing frosts) ranges from 150 in the northwestern counties to 200 in the southeastern. Killing frosts in May have occurred at all stations except Wichita and Columbus, the latest recorded occurring May 26, 1901. The dates of earliest killing frosts recorded in the fall range from September 7 in the northwestern counties to October 9 in the extreme southeastern.

WINDS.

The prevailing direction of wind is from the north during December and from the northwest during the rest of the winter. It is from the southwest to north during March and from the south during the rest of the year.

¹ See Monthly Weather Review, December, 1906, p. 579.